NPS Teams with Royal Thai Armed Forces to Test Wireless Networks

By Barbara Honegger

A Naval Postgraduate School faculty, student and contractor team joined forces with 11 Navy Reservists from the Office of Naval Research Science and Technology program in May and June to field test a rapidly deployable surveillance and tracking network in a drug interdiction exercise in Thailand, the longest standing U.S. treaty partner in Asia.

Data from air, ground and underwater sensors, unmanned aerial vehicles (UAVs), balloons and speedboats were fed into a Tactical Operations Center (TOC) and Royal Thai Armed Forces command, control, computers and intelligence centers.

"A critical backbone of the global war on terror and network centric warfare is the ability to rapidly field low cost mobile wireless communications networks in hostile environments with our coalition partners," said NPS information sciences research associate James Ehlert, Coalition Operating Area Surveillance and Targeting System (COASTS) project director.

"COASTS catalyzes this technology sharing while actively addressing the security needs of our key allies," he added. "It's a win-win, because sharing technology and expertise that makes our partners more secure also makes us more secure.

"The Thais learn how to better secure their borders, interior and littorals, and Naval Postgraduate School students gain valuable thesis research opportunities. For our DoD contractor partners, we operationally test cutting-edge commercial technologies in challenging terrains and climates and feed the results back to participating companies."

In addition to unattended air, ground and underwater sensors, the commercial-off-the-shelf broadband wireless network included four mini helicopters and two flying-wing UAVs with video cameras; Thai Navy speedboats conducting maritime surveillance and interdiction; wearable computers with shared situational awareness displays; a networked tethered balloon surveillance node with high resolution video; a mountain-top communications node with video camera and webcam; a full-color night vision camera; long-haul, point-to-point 802.16 and satellite reach-back links to the Royal Thai Air Force headquarters in Bangkok; and a TOC staffed with U.S. and Thai personnel.

The heart of the system was a cutting edge environmental and security monitoring system that processes inputs from all local and remote sensors and instantly displays them on laptops as well as wearable and handheld computer screens in an easily readable 3-D format.

"The COASTS surveillance and tracking network was able to transform visibility of only a few meters in hostile, humid jungle terrain into total shared situational awareness," said Lt. John Richerson, COASTS-06 student team leader who coordinated and ran the riverine drug interdiction exercise from the TOC. "From 2005 to 2006, the sensor-to-shooter grid has evolved into a mature test bed for C4ISR COTS technologies while providing our students and DoD contractors with unmatched learning and product development opportunities."

"The hardware is the easy part," Ehlert added. "The hard part is getting all the hardware, software and people to seamlessly work together."

COASTS exercises have proven highly valuable for the Royal Thai Armed Forces. The director general of the country's Defense Research and Development Office, Lt. Gen. Apichart Timsuwan, and Royal Thai Air Force Group Capt. Teerachat Krajomkeaw, who heads the Combat Research and Development Organization within the Directorate of Operations at the Royal Thai Air Force Headquarters, sponsored the 2006 program.

"The COASTS-06 field experiment program has been a great opportunity for science and technology information exchange and for exercising combined interoperability between the Royal Thai Air Force and the U.S. military," said Krajomkeaw at the Royal Thai Air Force headquarters after action meeting. "We hope to build on the success of COASTS-06 next year in COASTS-07."

"Next year's exercise — a terrorist interdiction scenario culminating in the Port of Honolulu — will add the Malaysian Maritime Enforcement Agency, the Office of Defense Cooperation Indonesia, Australia, and U.S. Navy (Commander, Seventh Fleet) and Coast Guard assets in Hawaii as additional operational partners.

"The exercise will also provide major warfighting value to the Navy Expeditionary Combat Command recently charged with implementing the CNO's vision for small boat patrol craft just taken over from the Marine Corps," Richerson said. "It will be an order of magnitude larger with multinational partners, a multimillion-dollar budget and major congressional attention."

"The technologies and capabilities demonstrated in COASTS-06 would be extremely useful for our operations in

Royal Thai Air Force Group Capt. Teerachat Krajomkeaw (left); Lt. John Richerson, NPS COASTS-06 student team leader (middle background); senior military officers from the Royal Thai Air Force and Interagency Intelligence Fusion Center; and NPS faculty network expert J.P. Pierson (right foreground) observe COASTS-06 operations from the TOC near Chiang Mai, Thailand.

Southern Thailand," said Royal Thai Air Force Air Marshall Suthichoti. "And they're applicable not just to the Air Force, but to the (Thai) Army and Navy as well."

"This was a wonderful opportunity to engage in military-to-military contact with the upper echelon of the Royal Thai Air Force that I'll be able to leverage throughout my career," Richerson added.

COASTS-06 was also of high value to the project's 12 commercial participants, including leading design engineers and three corporate chief executive officers.

"A big plus for COASTS commercial team members is that we can special engineer our equipment for worst case scenarios and test it in weather and terrain scenarios we wouldn't otherwise have access to, providing invaluable data for future product development," said Mercury Data Systems' COASTS liaison, senior network engineer and Navy Reserve Information Systems Technician 3rd Class Ryan Hale.

"The same communications system that has a 10-mile footprint in Monterey, Calif., (site of the Naval Postgraduate School), for instance, has only a one-half-mile footprint in Thailand, due in part to the high temperature and humidity of the area. You have to test in the actual environment to know how to configure the system.

"COASTS is one of the most unique programs connecting the military and commercial worlds," said Hale, also a former information sciences research assistant at NPS. "It lets us work hand-in-hand with the military in the design and development of an all-COTS system with real-world applications. Being a full partner has also opened DoD doors for us, for example, with the Office of Naval Research. As a result of our participation, we now also have opportunities with the Naval Research Laboratories, the Special Operations Command and others."

Some commercial technology used in the project was originally developed for COASTS. An example is Mercury Data Systems' TrakPoint, a mobile shared situational awareness tracking program that uses software and inertial gyros to locate and visually display on a laptop or workstation screen where the user has walked.

Above, Lt. Cmdr. Steve Padget and Lt. Joe Berrios of the Office of Naval Research Reserve Detachment prepare a RotoMotion VR-20 UAV for flight operations during COASTS-06 field tests in Thailand. Right, NPS operations research student Ensign "Red" Miller on the ground in Thailand during COASTS-06 with a Kestrel shoulder-mount camera, ruggedized 802.11g portable computer, and Deny-GPS, a precision inertial navigation system that allows his position to be calculated in a non-GPS environment. Data on Miller's position were relayed via an 802.11 wireless mesh network into the common operating picture viewed by officers in the Tactical Operations Center and other connected command centers.

By clicking map icons, a viewer can instantly see what is being recorded by cameras and other recording devices at multiple distant locations in near-real time, and access to the displays can be hierarchically controlled.

COASTS-06 U.S. sponsors included the Office of the Secretary of Defense; U.S. Pacific Command, with Mr. Chris Voght, USPACOM staff science adviser as chief liaison; U.S. Coast Guard Monterey; U.S. Embassy Bangkok; Joint Interagency Task Force-West; U.S. Marine Corps Systems Command; the Air Force Research Laboratory; and the U.S. Military Advisory Group Thailand.

International sponsors, participants and observers included the Royal Thai National Security Council; Royal Thai Defense Research and Development Office; Interagency Intelligence Fusion Center at Chiang Mai; Royal Thai Air Force Academy; Malaysian Maritime Enforcement Agency; Australian Defense Technology and Management Advisor, Thailand; and the National University of Singapore.

The program supports key USPACOM goals of regional maritime security, theater security cooperation, advancing the global war on terrorism and supporting homeland defense.

In addition to Ehlert, COASTS-06 NPS faculty members were Ed "Tuna" Fisher and networking expert John "J.P." Pierson, also a member of the NPS Innovation and Technology Center.

NPS students participating in the NPS-Thai exercise were Lt. John "Swampy" Richerson, student team leader; Lt. Robert "Ho" Hochstedler; Lt. John Powers; Ensign Ryan "Red" Miller; Ensign Joseph Russo; and Ensign Michael Chesnut.

The ONR Reservists were Capt. Paul Marshall, officer in charge; Cmdr. Paul Kling, UAV expert and assistant officer in charge; Capt. (Sel.) Pete Gamerdinger; Cmdr. Scott Guinn, assistant air boss; Cmdr. Dean Schmidt; Cmdr. Nathan Beltz; Lt. Cmdr. Steve Padget; Lt. Cmdr. Kevin Blenkhorn; Lt. Joe Berrios; Lt. Pitch Bencharit and Aviation Electronics Technician 1st Class Candido Gomez.

In addition to being a NPS inaugural COASTS partner, at any one time Thailand supports up to half a dozen officer students at the Naval Postgraduate School pursuing thesis research in support of their country's security needs.

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